

CLAIMS

1. A surface plasmon resonance sensor comprising a first unit and a second unit, said first and second units being separable, and wherein said first unit comprises:

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- a first housing,
- a film of electrically conducting material being adapted to support surface plasmons, said film being held by a first exterior surface part of the first housing,

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- optical input means positioned on a second exterior surface part of the first housing so as to receive an optical light beam from the second unit,

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- optical output means positioned on a third exterior surface part of the first housing so as to transmit an optical light beam to the second unit,

- a first set of optical elements being adapted to direct the received optical light beam from the first unit towards the electrically conducting film,

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- a second set of optical elements being adapted to direct an optical light beam from the electrically conducting film towards the optical output means so as to transmit the optical light beam from the electrically conducting film to the second unit,

25 and wherein said second unit comprises:

- a second housing,
- means for emitting an optical light beam,

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- a first set of optical elements being adapted to prepare the emitted optical light beam,

- optical output means positioned on a first exterior surface part of the second housing so as to transmit the prepared optical light beam to the first unit,
- optical input means positioned on a second exterior surface part of the second housing so as to receive an optical light beam from the first unit,
- detecting means being adapted to detect the optical light beam received from the first unit,
- 10 - a second set of optical elements being adapted to direct the received optical light beam from the first unit towards the detecting means,

wherein the propagation directions of the optical light beams at the positions of the optical input and optical output means are essentially perpendicular to the exterior surface parts of the first and the second housing so as to avoid refraction of the optical light beams upon entry of said optical light beams into the first and second unit.

- 2. A surface plasmon resonance sensor according to claim 1, wherein the emitting means comprises a laser source, such as a semiconductor laser diode.
- 20 3. A surface plasmon resonance sensor according to claim 1, wherein the emitting means comprises a light source emitting light at essentially a single wavelength.
- 25 4. A surface plasmon resonance sensor according to claim 1, wherein the emitting means comprises a light source emitting light at a plurality of wavelengths, such as a light emitting diode.
- 30 5. A surface plasmon resonance sensor according to claim 1, wherein the first set of optical elements of the second unit comprises means for collimating the emitted optical light beam.

6. A surface plasmon resonance sensor according to claim 5, wherein the first set of optical elements of the second unit further comprises means for polarizing the emitted optical light beam.

5 7. A surface plasmon resonance sensor according to claim 1, wherein the input and output means of the first and second units comprise antireflecting coatings.

8. A surface plasmon resonance sensor according to claim 1, wherein the detecting means comprises an array of photosensitive elements, such as a multiple photo 10 detector array, a charge coupled device or a complementary metal oxide semiconductor image sensor.

9. A surface plasmon resonance sensor according to claim 1 further comprising a light shield member.

15 10. A surface plasmon resonance sensor according to claim 1, wherein the first set of optical elements of the first unit comprises a diffractive member, such as a diffractive grating or a holographic grating, said diffractive member being adapted to transform a collimated optical light beam into a focused optical light beam.

20 11. A surface plasmon resonance sensor according to claim 1, wherein the second set of optical elements of the first unit comprises a diffractive member, such as a diffractive grating or a holographic grating, said diffractive member being adapted to transform a diverging optical light beam into a collimated optical light beam.

25 12. A surface plasmon resonance sensor according to claims 1, wherein the first set of optical elements of the first unit comprises a reflective member, such as a diffractive grating or a holographic grating, said reflective member being adapted to transform a collimated optical light beam into a focused optical light beam.

30 13. A surface plasmon resonance sensor according to claim 1, wherein the second set of optical elements of the first unit comprises a reflective member, such as a diffractive grating or a holographic grating, said reflective member being adapted to transform a diverging optical light beam into a collimated optical light beam.

14. A surface plasmon resonance sensor according to claim 1, wherein the second set of optical elements comprises a reflective member, such as a reflective mirror.

15. A surface plasmon resonance sensor according to claim 1, wherein the 5 electrically conducting film is a metal film, such as a gold film, a silver film, an aluminum film or a titanium film.

16. A surface plasmon resonance sensor according to claim 15, wherein the 10 electrically conducting film comprises a plurality of electrically conducting films, said plurality of films being arranged in a laterally extending pattern.

17. A surface plasmon resonance sensor according to claim 1 further comprising a layer of dielectric material being positioned between the electrically conducting film and the first exterior surface part of the first housing.

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18. A surface plasmon resonance sensor according to claim 16 further comprising a layer of dielectric material being positioned between each of the plurality of electrically conducting films and the first exterior surface part of the first housing.

20 19. A surface plasmon resonance sensor according to claim 1 further comprising moving means, said moving means being adapted to move the first and second unit relative to each other so as to move the focus point of an optical light beam relative to an electrically conducting film.

25 20. A surface plasmon resonance sensor according to any of claims 1 further comprising moving means, said moving means being adapted to move the first and second unit relative to each other so as to vary the angle of incidence of an optical light beam directed towards an electrically conducting film.

30 21. A surface plasmon resonance sensor comprising in combination two or more surface plasmon resonance sensors according to claims 1, said combination of two or more surface plasmon resonance sensors being arranged in a lateral extending pattern.

22. A method of determining the bio-/chemical composition of a sample using a surface plasmon resonance sensor, said surface plasmon resonance sensor comprising a first unit and a second unit, said first and second units being separable, and wherein said first unit comprises:

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- a first housing,
- a film of electrically conducting material being adapted to support surface plasmons, said film being held by a first exterior surface part of the first housing,

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- optical input means positioned on a second exterior surface part of the first housing so as to receive an optical light beam from the second unit,

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- optical output means positioned on a third exterior surface part of the first housing so as to transmit an optical light beam to the second unit,

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- a first set of optical elements being adapted to direct the received optical light beam from the first unit towards the electrically conducting film,

- a second set of optical elements being adapted to direct an optical light beam from the electrically conducting film towards the optical output means so as to transmit the optical light beam from the electrically conducting film to the second unit,

25 and wherein said second unit comprises:

- a second housing,
- means for emitting an optical light beam,
- a first set of optical elements being adapted to prepare the emitted optical light beam,
- optical output means positioned on a first exterior surface part of the second housing so as to transmit the prepared optical light beam to the first unit,

- optical input means positioned on a second exterior surface part of the second housing so as to receive an optical light beam from the first unit,
- detecting means being adapted to detect the optical light beam received from the first unit,
- a second set of optical elements being adapted to direct the received optical light beam from the first unit towards the detecting means,

10 wherein the propagation directions of the optical light beams at the positions of the optical input and optical output means are essentially perpendicular to the exterior surface parts of the first and the second housing so as to avoid refraction of the optical light beams upon entry of said optical light beams into the first and second unit.

15 23. A surface plasmon resonance sensor comprising a first unit, said first unit comprising:

- a first housing,

20 - a layer of electrically conducting material being adapted to support surface plasmons, said layer being held by a first exterior surface part of the first housing,

25 - optical input means positioned on a second exterior surface part of the first housing, said optical input means being adapted to receive an optical light beam,

- optical output means positioned on a third exterior surface part of the first housing, said optical output means being adapted to transmit an optical light beam,

30 - a first diffractive optical element being adapted to direct the received optical light beam towards the electrically conducting layer,

- a second diffractive optical element being adapted to direct a reflected optical light beam from the electrically conducting layer towards the optical output means,

5 wherein the propagation directions of the optical light beams at the positions of the optical input and optical output means are essentially perpendicular to the exterior surface parts of the first housing so as to avoid refraction of the optical light beams at the positions of the optical input and optical output means.

10 24. A surface plasmon resonance sensor according to claim 23 further comprising a second unit, said second unit comprising:

- a second housing,

15 - means for emitting an optical light beam,

- a set of optical elements being adapted to prepare the emitted optical light beam,

20 - optical output means positioned on a first exterior surface part of the second housing, said optical output means being adapted to transmit the prepared optical light beam to the first unit,

- optical input means positioned on a second exterior surface part of the second housing, said optical input means being adapted to receive an optical light beam

25 from the first unit,

- detecting means being adapted to detect the received optical light beam from the first unit,

30 wherein the propagation directions of the optical light beams at the positions of the optical input and optical output means are essentially perpendicular to the exterior surface parts of the second housing so as to avoid refraction of the optical light beams at the positions of the optical input and optical output means.

25. A surface plasmon resonance sensor according to claim 24, wherein the second unit further comprises an optical element being adapted to direct the received optical light beam from the first unit towards the detecting means.

5 26. A surface plasmon resonance sensor according to claim 24, wherein the light emitting means comprises a laser source, such as a semiconductor laser diode.

27. A surface plasmon resonance sensor according to claim 24, wherein the light emitting means comprises a light source emitting light at essentially a single 10 wavelength.

28. A surface plasmon resonance sensor according to claim 24, wherein the light emitting means comprises a light source emitting light at a plurality of wavelengths, such as a light emitting diode.

15 29. A surface plasmon resonance sensor according to claim 24, wherein the set of optical elements of the second unit comprises means for collimating the emitted optical light beam.

20 30. A surface plasmon resonance sensor according to claim 29, wherein the set of optical elements of the second unit further comprises means for polarizing the emitted optical light beam.

31. A surface plasmon resonance sensor according to claim 24, wherein the input 25 and output means of the first and second units comprise antireflecting coatings.

32. A surface plasmon resonance sensor according to claim 24, wherein the detecting means comprises an array of photosensitive elements, such as a multiple photo detector array, a charge coupled device or a complementary metal oxide 30 semiconductor image sensor.

33. A surface plasmon resonance sensor according to claim 23, wherein the first and second diffractive optical element of the first unit comprises an optical grating, such as a reflective holographic grating.

34. A surface plasmon resonance sensor according to claim 23, wherein the electrically conducting layer is a metal film, such as a gold film, a silver film, an aluminum film or a titanium film.

5 35. A surface plasmon resonance sensor according to claim 23, wherein the electrically conducting layer comprises a plurality of electrically conducting layers, said plurality of layers being arranged in a laterally extending pattern.

10 36. A surface plasmon resonance sensor according to claim 23 further comprising a layer of dielectric material positioned between the electrically conducting layer and the first exterior surface part of the first housing.

15 37. A surface plasmon resonance sensor according to claim 35 further comprising a layer of dielectric material positioned between each of the plurality of electrically conducting layers and the first exterior surface part of the first housing.

38. A surface plasmon resonance sensor according to claim 23 further comprising moving means, said moving means being adapted to move the first and second unit relative to each other so as to move the focus point of the an optical light beam 20 relative to one or more of the electrically conducting layers.

39. A surface plasmon resonance sensor according to claim 23 further comprising moving means, said moving means being adapted to move the first and second unit relative to each other so as to vary the angle of incidence of an optical light beam 25 directed towards to one or more of the electrically conducting layers.

40. A surface plasmon resonance sensor comprising:

- a transparent member,
- 5 - a layer of electrically conducting material being adapted to support surface plasmons, said layer being held by an exterior surface part of the member,
- 10 - a first optical grating being held by a first exterior surface part of the member and being adapted to direct a received optical light beam towards the electrically conducting layer, wherein the propagation direction of the received optical light beam at the position of the first optical grating is essentially perpendicular to the first exterior surface part of the member and wherein the received optical light beam is substantially collimated, and
- 15 - a second optical grating being held by a second exterior surface part of the member and being adapted to receive an optical light beam from the electrically conducting layer and being adapted to re-emit the optical light beam received from the electrically conducting layer, wherein the propagation direction of the re-emitted optical light beam at the position of the second optical grating is essentially perpendicular to the second exterior surface part of the member and wherein the re-emitted optical light beam is substantially collimated.
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41. A surface plasmon resonance sensor according to claim 40 further comprising

- 25 - means for emitting an optical light beam,
- a set of optical elements being adapted to prepare the emitted optical light beam,
- and
- 30 - means for detecting the re-emitted optical light beam.

42. A surface plasmon resonance sensor according to claim 41 further comprising an optical element being adapted to direct the re-emitted optical light beam towards the detecting means.

43. A surface plasmon resonance sensor according to claim 41, wherein the light emitting means comprises a laser source, such as a semiconductor laser diode.

44. A surface plasmon resonance sensor according to claims 41, wherein the light emitting means comprises a light source emitting light at essentially a single wavelength.

45. A surface plasmon resonance sensor according to claim 41, wherein the light emitting means comprises a light source emitting light at a plurality of wavelengths, such as a light emitting diode.

46. A surface plasmon resonance sensor according to claim 41, wherein the set of optical elements comprises means for collimating the emitted optical light beam.

47. A surface plasmon resonance sensor according to claim 46, wherein the set of optical elements further comprises means for polarizing the emitted optical light beam.

48. A surface plasmon resonance sensor according to claim 41, wherein the detecting means comprises an array of photosensitive elements, such as a multiple photo detector array, a charge coupled device or a complementary metal oxide semiconductor image sensor.

49. A surface plasmon resonance sensor according to claim 40, wherein the electrically conducting layer is a metal film, such as a gold film, a silver film, an aluminum film or a titanium film.